N. A. C. A. BULLETIN

Section I

Vol. VII, No. 14 March 15, 1926

Engineering Costing and Works Accountancy—Its Objects and Necessity

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Published semi-monthly by the National Association of Cost Accountants, 130 West 42nd Street, New York. Subscription price, $15 per year. Entered at the Post Office, New York, N. Y., as second-class matter.

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MARCH 15, 1926

National Association of Cost Accountants

Editorial Department Note

Our current Official Publication is a reprint of an article by Roland Dunkerley, F.C.W.A. appearing in the January, 1926, issue of The Cost Accountant, the official journal of the British Institute of Cost and Works Accountants. In this connection, it is pleasantly recalled that Mr. Dunkerley was in attendance at the national convention of the N.A.C.A. held at Cleveland in 1921 as the official representative of the British Institute. At that time he presented before our convention a paper dealing with the Executive Uses of A Cost System which was very favorably received. The present paper is a straightforward statement of the advantages and value of cost accountancy and should prove enlightening in industrial quarters where the advantages of cost accounting are little understood and its value little appreciated. Mr. Dunkerley is Works Accountant of the Metropolitan Vickers Electric Company, Ltd., Manchester, England.

ENGINEERING COSTING AND WORKS ACCOUNTANCY—ITS OBJECTS AND NECESSITY

Accounting practices have been observed for centuries, but the specialized function of Cost Accounting is, relatively speaking, a new departure. This being the case, it is perhaps not irrelevant to refer to the evolution which has taken place in the industrial pursuits of the country from the time when England embarked on developing her manufacturing industries, with the object of showing how the play of economic factors has tended towards the present state of affairs, if it has not actually forced scientific costing on industry.

Although trading companies existed in the 17th and 18th centuries, the means of communication were very slow and unreliable, with the result that to a large extent producer and consumer lived alongside each other, and industry, apart from agriculture and mining, was carried on almost entirely in the homes of the people. In the latter years of the 18th century and the early part of the 19th century this country was developing industry fairly rapidly and the fact that America was as yet sparsely populated and Eastern countries had not yet advanced into industry, made this country the industrial centre of the world and trade poured into it from all quarters.

In a state of affairs such as this, sufficient business was forthcoming for all, and the necessity for specialized knowledge in organization, manufacturing, or selling had not yet presented itself in an acute form. The most marked development which took place during that period was the extension of the factory system and the tendency to concentrate industries in definite centres.

The last century was one of continual industrial progress and

the opening up of ready means of communication disseminated knowledge and gradually countries which had hitherto bought their manufactures abroad started to enter into competition with us.

The outcome of this increasing competition has been to reduce profit margins to very fine factors, so fine in many cases, that small differences turn the scale, and it has become essential to have much more detailed information respecting manufacture than was previously necessary. General Accountancy has been, and still is, primarily concerned with the external transactions of a business in its dealings with customers, suppliers, and banking concerns, and with the recording of the trading results from the financial point of view. Whilst still fulfilling essential services it fails to supply executives with the detailed information relative to the internal transactions of the organization. Cost Accountancy, if properly applied, should provide this information and it may be truly stated, therefore, that the development of the science is a direct result of the play of economic forces increasing competition and reducing profit margins, culminating in the necessity for more scientific management.

Obviously then, if these conditions prevail and industry, which is the foundation of our livelihood, is to be carried on, it is of equal importance to the worker in the shops as to the management that all risks should, as far as possible, be eliminated and business taken at prices based on a secure foundation.

It may be said that the law of supply and demand governs prices and that in many cases cost is of secondary importance, but ultimately it is the cost that counts, because of course no organization can exist that continues to take orders, however many, on an uneconomic basis.

As an instance of the successful business based on the foundation of the elimination of unnecessary risks one has only to turn to the great Banking Institutions to realize what can be done. The thought probably arises that they have special advantages, but manufacturing organizations are in almost as good a position as the banks so far as their outside losses, such as bad debts, are concerned, and these are such a small factor in most business that they can be ignored. It is therefore other risks that require to be watched which the banks apparently reduce to a minimum.

It will most probably be found that the answer to why, say, the engineering industry is not so stable as the banks lies in the fact that the majority of these risks are not very obvious to the man who is largely occupied with production and with technical matters. Further, due to the nature of his training, he cannot usually appreciate the result of the lack of strict control of values until he receives a copy of some concentrated statement such as a Trading Account or Balance Sheet. It is in just this function of discovering these hidden risks or losses that a carefully designed system of Cost Accountancy proves itself to be an essential service in a manufacturing concern.

The question may be asked: How does the Cost system assist in the elimination of losses or help to increase efficiency? But be-

fore endeavoring to answer such a question one might reasonably look where wastages and losses take place. Experience rather tends to the view that when wastage is spoken of it is immediately assumed that it is due to misapplication by, or as the direct result of, carelessness on the workers' part. It may be that the organization of the business is wrong and that wastage results as a consequence.

Some little time ago the Federated American Engineering Societies set up a Committee on the subject of "Waste in Industry," of which Mr. Hoover was the Chairman, and in their report they made the somewhat startling statement that 67 per cent. of waste which existed in industries was due to management. One of the functions therefore of Cost Accountancy is to assist the management in examination of itself, and it does this by reviewing all the expenses which are incurred, pointing out where they are incurred, why they are incurred, and endeavoring to get some relative figure against which these may be assessed. Cursory glances at details of expenses are not enough, nor is the turning out of figures, however carefully done by the Cost Department, of any value unless their significance is appreciated and transmitted to the persons concerned.

Costing aims at collecting and classifying these expenses under distinctive headings and from these comparisons with previous results are made, always bearing in mind the conditions obtaining at the time the relative sets of figures were prepared and reading into them signs of change which may or may not be to the ultimate good.

Its next function is to see that the price on which the work is taken is based on sound information and it is in this particular portion of Cost Acountancy that the workers in the shops should be vitally interested. There still appears to exist in the shops and factories a suspicion that Cost Departments only exist for the purpose of providing the management with reasons to apply pressure, and that they themselves have no personal interest in it. This is, of course, fundamentally wrong because, as has been previously explained, the success of the industry is the foundation of our livelihood and, therefore, anything that strengthens the industry is beneficial to all concerned. Most workers make contact with the Cost Department through the wages and timebooking side and through the system put in to record withdrawals from stores and usages of materials. If the Cost Department is to provide information which is to be used as a basis for fixing prices, either by estimators or salesmen, the information on which it is based must be as accurate as is humanly possible, hence the pressure which the Cost Department puts on to the persons responsible for recording time and the systems put in to see that the materials are not withdrawn without details being available.

In these days of fine margins, wrong information may easily lead to orders being taken at an unremunerative price and considerable losses incurred which may not have been suspected at the

time, or, on the other hand, equally serious is that too high a price may be quoted and orders lost in consequence.

It is obvious that if this accuracy is to be carried out and indeed if the workman is to receive all that is due to him for his labors, the human element, which is the cause of most errors, must be eliminated and for this purpose many kinds of mechanical appliances such as time recorders have been introduced. Although the introduction of these mechanical appliances is regarded with very grave suspicion and in many cases as a yoke to be borne, it is suggested that calm consideration will show that appliances of this kind are a source of security both to the worker and to the management.

Most of the discussion which ranges round the subject of "Cost" has hitherto been taken as applying to the factory only, but of course in many articles the cost of selling is a much greater proportion than the cost of manufacture and it is just as important that the selling costs be subjected to scrutiny as those of the factory. In fact, in view of the lesser opportunities for personal supervision that exist in selling organizations, it is of the utmost importance that their expenses and results should be closely examined to ascertain efficiency.

The importance of costing has been so realized that modern tendencies in accounting are to organize so that the cost records are the foundation on which the financial accounts are built, rather than that the system should be distinct from and have no direct connection with the financial organization.

At this juncture it may be well to define exactly what is meant by "Cost."

For ordinary purposes cost practically divides itself into two main headings:—

(1) Factory Cost

The factory cost of any product is the sum total of all expenditure incurred in the manufacture of the product from the placing of the order in the factory up to the time of, but not including, packing or despatch.

(2) Commercial Expenses

Commercial Expenses comprise all charges incurred in the primary initiation of the enquiry and order, and the final disposal and charging of the product, including packing and despatch from the works up to delivery to the purchaser.

Factory Cost may be sub-divided as follows:—

(1) Material

Productive material, being the material used (in production) which can be directly specified for inclusion in the manufactured product.

Note.—Castings at cost price would be considered as productive material.

(2) Labor

Productive labor, being all labor directly applied to the productive material, for altering it in form or substance, or in its assembly.

(3) Factory Expenses

Being charges and expenses for material, labor, services (including power, light, heating, tools, replacements, purchasing), and other charges incurred by, or chargeable directly to, the factory, such as rents, rates, taxes, contributions under national insurance schemes, depreciation, supervision, administration, other than those already included under the headings:

(1) Material, (2) Labor, as set out above.

The amount of detail under which these headings can be segregated depends of course on the nature of the business or product.

Whilst in some cases the cost of an individual article or job may be required, in other cases this might be by weight or some other measure of quantity. Some types of product lend themselves to costing by process but in every case whether the total cost of the job, the more detailed cost under the headings of Labor, Factory Expenses and Material, by operations, or the cost of the individual pieces building up the whole are required, the system should be such that this information can be readily obtained.

One of the essential features of any cost system is that of flexibility so as to allow for contraction or expansion of information as circumstances demand. It will be apparent that if expense is going to be incurred in recording detailed information which is continually being repeated there is the danger that the cost of the system will outweigh its advantages. At the same time, however, the system should be so organized that the bulk cost results may be analyzed in fine detail in the event of there being any marked variation from the standards previously determined.

Surveying the component elements of cost, materials are invariably the largest item necessitating organized system and the first essential to the proper control of materials is a sound storekeeping system, embracing entry of material in the factory and stores and the withdrawals therefrom.

From all points of view it is essential that there shall be economical use of materials in the manufacturing department.

It is said by what we might term the "Practical Man" that the checking of the amount of material which goes on to a job is a simple matter and can be controlled by supervision, but it is not the visible waste which is the danger but the unseen waste which only careful records can bring to light, that runs up the cost.

In the case of labor where piecework is in vogue the fixing of piecework prices does to a degree govern this factor, but the number of processes performed and the time spent on operations other than those originally scheduled form a striking figure when cost investigations are carried out. It is by pointing these out

that the Cost Department can assist the Management and Designers, because probably they are due to the practical carrying out of theoretical designs, or because the necessary machines or tools originally provided for are not available; but in any case these are factors which add to the cost and which visible supervision does not readily ascertain. It is by attention to detail such as these that costs can be reduced.

The inclusion of Factory Expenses owing to the factors involved in applying, present the greatest problem in the ascertaining of costs. The apportionment may be made in several ways, but as no two factories are alike in organization or policy, each concern must receive special consideration to determine the choice of method, or combination of methods to suit the needs of the particular case. Without going into fine detail the following are some of the methods adopted for the allocation of expenses:—

(1) *Percentage on Productive Labor.*

Basis Normal total factory expense.
Normal total productive labor.

Where the product rates of pay and the equipment used are substantially identical this method is probably sufficiently accurate for practical purposes. Immediately, however, variations in the size and variety of work, class of machine, or type of labor, are introduced complications arise.

(2) *Productive Man Hour Rate.*

Basis Normal total factory expense.
Normal total productive man hours.

This method overcomes the disadvantage in the variations in rates of pay, but it does not deal with the further problem where variations in equipment are used.

(3) *Tonnage or Unit Output Rate.*

Basis Normal total factory expense.
Normal output either in the form of tonnage or other unit.

This method is applicable to cases where the apparatus manufactured is confined to one type or class or product, with a limited range of sizes.

(4) *Machine Hour Rate* or a rate per hour for the use of the machine.

Basis Normal total factory expense.
Normal total No. of hours machine tool or tools operate.

The entry of female labor into industry operating expensive machinery illustrates the effect a distribution on a percentage on productive labor basis would have as compared with the apportionment of indirect expenses on the more scientific method of a rate per hour for the use of machine.

Having decided on the method the prime factor is that the incidence of the expense shall be correctly determined and that the

total expenses taken over a suitable period be fully apportioned. In this connection it is important to bear in mind that the fiscal year is a purely arbitrary period, and will not as a rule correspond with periods of good and bad trade, and is probably therefore an insufficient period on which to base the rates to be applied. In order therefore that true means or normal rates may be established and maintained, a period of time must be taken which includes seasonal fluctuations or cycles of trade.

The whole idea underlying the distribution is that the total expenses of the factory shall be absorbed in the costs set against sales in the Financial Books, and therefore, if the rates fixed do not cover these the balance, either profit or loss, shall be written off. It may be said that the rates fixed ought always to absorb the expense, if so then of course in periods of fluctuating trade rates would oscillate and cost comparisons be made useless. Hence the fixing of rates based on what is known to be a normal period of trade.

Another field in which Cost Accountancy functions to the advantage of business is by its attention to the amount of stocks and work in progress held in the factory. It is a fact that it is only in times of stringent financial difficulties that many firms realize how much of their capital is locked up in the factory. Apart from the result of financial manipulation many firms have in the past found themselves short of capital and instead of being informed of the fact as to where their capital was really locked up and how, and what could be liquidated, they resorted to the easy method of obtaining more capital and then when trade conditions have been depressed found themselves with a heavy load of capital for which Shareholders are calling for some return in the way of dividend. This question of the locking up of capital in the factory and the retention of fluid capital which is so necessary to the successful carrying on of business can only be controlled if proper records are kept and from month to month, or at some stated period, information shall be available as to what money is locked up in this way and where. The old fashioned way of finding this out each year end at a physical inventory is not satisfactory under modern business conditions.

Money can be locked up in the factory under two main headings—that in the stores, either in the form of raw materials, semi-finished or finished stock, or on the floor of the shop in the form of jobs in progress. The institution of a planning or production department properly functioning reduces the latter figure to a minimum, but there is always the tendency to play safe in the obtaining of the material. Whilst this may be necessary, it is equally essential to know what it costs to do it, because if material is available on the floor of the shop there is always the temptation to work on it before necessary, which, of course, as wages have to be paid for the work done, results in more money being locked up. It is realized that it may be an advantage to do this under certain conditions rather than allow the machines to stand idle and this

argument of course is also advanced in the case of putting jobs on to machines for which they are not suitable or given to certain classes of workers who are not acquainted with them, in order to keep the machines occupied, but whilst all these things are studied from the practical point of view it is very rarely that the cost of doing it is fully appreciated. This is another example of unseen waste.

Reverting to the subject of Factory Expenses these are, as previously pointed out, a very great source of leaking waste. Experience has proved that if they are to be kept down to the minimum it is necessary not only that they be examined in total but also in very fine detail, and further that this examination be carried out at regular short intervals in order that increases and changes may be localized.

It is insufficient for purposes of control that the Cost Accountant merely intimates results but must advise what changes there are, and where they are, and for this purpose a properly organized system would have these expenses analyzed.

It would be a further advantage if these expenses are divided between (*a*) those for which the shop themselves are responsible, and (*b*) those which are charges for services over which they have no control. In the bigger organizations these could be carried a step further and the shop expenses divided between those under the individual foreman as against those which are purely departmental; but this matter of expansion or contraction would be entirely dependent on local circumstances.

As with actual costs it is necessary when investigating these factory expenses that full cognizance should be taken of circumstances pertaining at the particular time, and it is just as essential that these be compared with some predetermined standard of comparison. If this can be a budgeted figure based on a probable output this would be an ideal comparison, but where this is not possible a comparison against previous results is an advantage.

Many valuable pointers can be obtained from a study of the expenses of a factory—for example—What does waiting or idle time cost? Where is it and why? This gives the management or shop foreman a lead if application is being made, say, for additional crane facilities, provision of more tools, or additional machines.

The expenses of transport are some criterion of whether the layout of the shop is efficient.

The cost of repairs to machines would show whether money is being spent repairing machines or whether it would pay to expend it on buying new ones.

The cost of overtime and night rate allowance might be used in discussing the provision of further plant and machinery. Included in this also is the point of whether the work is being evenly distributed or whether overtime is being worked on some machines, whilst other machines equally useful in some other part of the shop are standing idle.

From these few examples will be seen the directions in which

Cost Accountancy can assist in the exploration of efficiency within the factory. Statistics of all kinds are naturally called for from the Cost Department and many of these figures provide information which enables management to be carried on, not in the haphazard way of the past, but with all the facts before them and where economies are required to be made they can be made after careful study of possible effects so that there will be the maximum of benefit to the management and a minimum of inconvenience to the worker.

Commercial Expenses

Commercial expenses include all items incidental to Advertising and Selling, also Administration. By reason of their nature, the control of this class of expense presents the Cost Accountant with one of his most thorny problems. The Accounting system should be so organized that, as for the factory, complete analyses may be obtained in order to determine the incidence of the expense. Comparisons should be made from the figures so compiled to establish, in conjunction with output figures, standards of expense to be used as budget figures for subsequent periods and to which the commercial side of the organization must be limited.

This subject of commercial expenses necessitates the closest study within the individual organizations, but, as previously pointed out, the first essential is to be in possession of the facts, and to determine subsequent action from them.

The growing tendency for labor to be interested in management of industry will naturally demand that information shall be available in a form which can be readily assimilated, not only as to its nature, but how it has been compiled. The close following of the trend of attempts to reconcile the relative cases prepared by management and labor in the case of recent trades disputes shows the necessity for some central source of information which each side can have confidence in and as the fundamental sin of Cost Accountancy is to ascertain facts, there is a growing feeling that the services of Cost Accountants and the information they have available will be more closely allied with industrial disputes in the future than they have been in the past.

It is difficult to summarize a paper which is so general in its aspect as this, but perhaps it would not be presumptious to say that Cost Accountancy provides a safety factor in present day business, and, furthermore, that this safety factor increases in direct proportion to the thoroughness with which it is applied.